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ABSTRACT

Intended to raise researchers' and teachers' awareness of fingerspelling as an important part of signed communication, a study examined its use with deaf children in the classroom. Five trained teachers of the deaf, participating in a demonstration total communication project in a public school in the Midwest, were videotaped in their own classrooms. Their fingerspelled utterances were transcribed and analyzed for form, content, and use. Findings indicated that these teachers did not fingerspell often, but when they did, they sought to express a specific English word. The clarity of their fingerspelled utterances varied greatly, ranging from whole word gestalts to words wherein individual letters could be discerned. References are included. (SR)

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C. Tane Akamatsu and David A. Stewart

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Abstract

This paper is intended to raise researchers' and teachers' awareness of fingerspelling as an important part of signed communication. Five trained teachers of deaf children were videotaped, and their fingerspelled utterances were transcribed and analyzed for form, content, and use. The data showed that these teachers did not fingerspell often, but when they did, they sought to express a specific English word. The clarity of fingerspelled utterances varied greatly, ranging from whole word gestalts to words wherein individual letters could be discerned. Implications of these findings are drawn and several hypotheses about the use of fingerspelling in total communication programs are suggested.

FINGERSPELLING WITHIN THE CONTEXT OF SIMULTANEOUS COMMUNICATION[1]

C. Tane Akamatsu and David A. Stewart[2]

One facet of simultaneous communication that has been virtually ignored is the use of fingerspelling. This paper is intended to raise researchers' and teachers' awareness of fingerspelling as an important part of signed communication. It is particularly important because this is where the connection between signing and English is most obvious and where literacy instruction begins. There are several questions that arise with respect to fingerspelling in total communication classrooms. What communicative situations lead teachers to fingerspell? How much do teachers fingerspell? How well do teachers fingerspell? To some extent, the answer to the "how well" question depends on the communicative intent of the teacher. For example, do teachers fingerspell because they wish to use an English word, or do they desire to teach a new word? Can a child be expected to rely on a gestalt of the word or is it important for individual letters to be clearly perceptible? Finally, what are deaf children expected to do with fingerspellings that their teachers use? We do not have answers to all of these questions. However, we do expect deaf children to learn English words and their spellings, recognize these words in print, and be able to write them. Furthermore, Hanson, Liberman, and Shankweiler (1984) found that deaf children who are good readers use both speech and fingerspelling encoding for short-term memory, whereas poor readers make no use of either a speech-based or fingerspelling-based code.

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[1]An earlier version of this paper was presented at the American Educational Research Association meeting, San Francisco, in April 1989.

[2]Tane Akamatsu is associate professor and David Stewart assistant professor of counseling, educational psychology and special education at Michigan State University. Akamatsu is a senior researcher with the Total Communication Project and Stewart is the project coordinator.

Simultaneous communication, especially using manual coded English (MCE) and speech was designed to represent English in both the signed and spoken forms. The many systems developed for this purpose attest to the great lengths to which educators went to ensure that English was duly signed. In the last 15 years, MCE systems have become widely used despite considerable debate over the merits of such systems. These debates have pointed out that some of the invented signs appear to violate sign formation rules of ASL, and the practice of "initializing" signs (substituting the handshape representing the initial letter of the English translation or synonym, e.g. W for WAY, S for STREET) has resulted in overly redundant signs (e.g. R for RIGHT meaning "correct"). These innovations may have resulted from the rush to "find signs for everything" in an effort to communicate through simultaneous communication, without adequate exploration of the lexicon of ASL, from which most MCE signs were either borrowed or derived.

It is worthwhile emphasizing that it is in school that children are expected to begin the arduous process of learning to spell. They are expected to be able to recite the letters in many words in the correct order and write these words on paper. Without recourse to the (sound) phonetic base of English, deaf students must simply commit spellings to memory. In addition, because of the intimate connection between fingerspelling and print, children are eventually expected to read fingerspelling as it is intended to be processed: a series of letters representing an English word. Therefore, there is a need to improve our understanding of fingerspelling and how it influences the English language skills of deaf students.

Fingerspelling in Signed Discourse

Observations of fingerspelling in ASL have shown that discourse among deaf adults and between adults and children is peppered with fingerspelling (Akamatsu, 1982; Battison, 1978; Padden & LeMaster, 1985). These words include names, abbreviations, words that are not in the ASL lexicon, and words spelled for emphasis. This does not include the corpus of "fingerspelled" loan words (Battison, 1978).[3]

Fingerspelling can be fast. Fluent fingerspellers have been clocked at around 170 milliseconds per letter (Battison, 1978; Bornstein, 1965; Hanson, Liberman, & Shankweiler, 1984; Zakia & Haber, 1971). By sheer speed alone, we would not expect people to be reading individual letters, but rather whole words, or at least letter patterns, as gestalts. Indeed, Hanson (1981) noted that the processing of individual letters in both words and nonsense words that followed English spelling rules was affected by the surrounding letters. She also noted that nonsense words that did not follow English spelling rules were processed as a sequence of individual letters.

Zakia and Haber (1971) suggested that because of the speed of normal fingerspelling, people do not read individual letters, "but rather the total pattern of the finger configuration, or at least enough of that pattern to identify the word" (p. 114). Akamatsu (1982) termed this pattern the "movement envelope." In his study of the phonetic structure of fingerspelling, Wilcox (1988) found that the entire hand functions as a whole unit in fluent signers, but the fingers operate independently in nonfluent signers.

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[3]A loan word is a word borrowed from another language and incorporated into an existing language. ASL borrows words from English via fingerspelling, and changes the form of the word so that it is no longer a fingerspelled word but actually becomes a sign.

This suggests that as fluency develops in both production and perception, the word rather than the letter should be the basic unit of analysis.

We would expect that in MCE, fingerspelling would be even more prevalent than in ASL for four reasons: (a) MCE is encoded English and would therefore not necessarily have signs for grammatical morphemes unique to English; (b) as a system rooted in the English-dominant educational system, it is the ideal mechanism by which to introduce new vocabulary in that it spans the gap between signing and print; (c) if there is a specific English word the signer wishes to use, the word can be fingerspelled; and (d) MCE is likely to be used by hearing teachers whose ASL vocabulary may be limited.

It has been argued by Akamatsu (1982) and Padden (1986), among others, that very young children (i.e. prereaders) who have received a healthy dose of fingerspelling from their deaf parents will attempt to fingerspell with varying degrees of success. Some of the "success" can be attributed to forming enough of a gestalt of the word for adults to recognize (Akamatsu, 1982). Their productions of words that were always fingerspelled preserved the movement envelope of the target word even though the target handshapes were not there. At other times, children have actually memorized the correct sequence of letters in the word. However, in between these two extremes, lies a twilight zone of alphabet soup for both children and adults.

Padden and LeMaster (1985) and Padden (1986) described a child who progressed from invented spellings using a limited set of handshapes to attempts at spelling beginning with the handshape of the corresponding sign (e.g. spelling "purse" beginning with an S, the handshape used in the sign PURSE), to knowing that she did not know the correct spelling but being helpless to do anything about it. In the absence of acoustic information,

these inventions are very different from the novel, prevowel-shift spellings that Read (1975) observed in hearing children of the same age.

It would not be surprising to find that deaf school children process fingerspelling as gestalts. For ordinary communicative purposes, this is probably just fine. However, for learning new English vocabulary and spelling, this is inadequate. Perhaps we cannot as yet throw out the notion of a cipher (letter-by-letter) model of fingerspelling. In this paper, we examine the use of fingerspelling by five experienced hearing teachers of the deaf who received their preservice training in total communication programs and have been teaching for several years in total communication programs. These teachers may be considered typical in that they all learned to sign in adulthood as part of their education.

Method

Subjects

Five trained hearing teachers of the deaf participated in this study. These teachers were participating in a demonstration total communication project in a public school in the midwest (Stewart et al., in press). Some of the deaf students in these classes spent varying amounts of time in integrated classes. All of the data were collected while the teachers were giving lessons to students in their own classrooms (not in the integrated rooms).

They had all received preservice training in total communication methods. With the exception of one, all of the teachers had been teaching for a minimum of five years. They ranged in fluency in simultaneous communication and in their knowledge of ASL. The school system's communication policy was to use a modified form of Signed English, with ASL as an intervention tool (Stewart, 1988). At the time the data were collected, ASL had not been systematically

used, and the teachers were in the process of perfecting their use of a modified form of Signed English.

Procedure

Two hours of videotaped data were collected as the teachers presented various lessons throughout a school day. During each two-hour sample, approximately 1,000 utterances (signed, spoken, etc.) per teacher were observed. The tapes contained both formal presentations and informal conversation, interpretations of announcements over the public address system, and talk between the teachers and interpreters/aides. In short, the videotapes contained typical kinds of interactions that occur in a classroom.

Data were transcribed, and all instances of fingerspelling were extracted for analysis.

Coding

Each instance of fingerspelling was coded as one of the following:

1. correct spelling of target word
2. incorrect spelling of target word (e.g. T-R-A-D-I-Y for tardy)
3. conventional abbreviation (e.g. M-R-S for Mrs.; F-L-A for Florida)
4. false start leading to correct spelling (e.g. D-E/D-O-E-S for does)
5. false start leading to incorrect spelling (e.g. C-O/C-E-N-M-A-T for cement)
6. incomplete word, not abbreviation (e.g. Y-N-F for infection)

Results

Quantitative Measures

Researchers observed 396 fingerspelled words across the 5,000 utterances. Table 1 shows the breakdown of frequency of occurrences, number of unique words (including names), mean length of fingerspelled word, and number of

words longer than five letters long that were attempted. The teachers are arranged in order of age of their students. Therefore, Teacher 1 had the youngest students (preschool), and Teacher 5 the oldest (high school).

Frequency of Occurrence of Fingerspellings

Teacher	# of instances	# of different words	Mean length of word	# words attempted > 5 letters	% correct
1	15	11	3.27	1	47%
2	92	34	3.37	11	56%
3	98	42	3.52	17	67%
4	80	38	3.30	29	31%
5	111	33	4.14	34	34%

From this table, we see that the teacher with the youngest students fingerspelled the least, whereas the teacher with the oldest students fingerspelled the most. There was also a direct correlation between the age of the student and the average length of fingerspelled word, although the range of mean length of word was fairly tight (3.27-4.14 letters). In general, the younger the student, the shorter the word. It was also true that the more occurrences of fingerspelling, the longer the words tended to be. Perhaps the teachers who were more confident about their fingerspelling would attempt more and longer words than the less confident.

The "hit" rate, that is, the number of words that were spelled correctly (first time, after a false start, or conventional abbreviation) was quite low, ranging from 31% to 67%. This was not related to the age of student, the amount of fingerspelling, or length of word, nor indeed of the quality of

signing in general. This seemed to be an individual variation within a teacher's abilities. The preschool teacher produced a total of 11 unique words in her 15 instances of fingerspelling. However, from Grade 1 through high school, the number of unique words used varied little (34-42 words).

Qualitative Measures

As mentioned above, the hit rate was fairly low, especially if one of the purposes of fingerspelling in school is to introduce children to new words to enable them to recognize it and produce it in print or in teaching synonyms for a sign. It might prove useful, therefore, to examine some of the errors that were found. The fingerspellings observed in this study were different from the invented spellings of hearing children (Read, 1971), and from the invented spelling of deaf children (Padden & LeMaster, 1985). When hearing children invent spellings, they tend to use letter names as clues to the sounds in a word (e.g. LFN for "elephant"), whereas deaf children have been observed to use the sign handshape as the first letter of a word (e.g., beginning the word "purse" with an S).

Many of the errors occurred because a medial letter was deleted, usually a vowel. Examples of these include F-V-E for five, C-E-M-N-T for cement, and T-P-E for tape. These are predictable in the sense that it is part of the initial process by which fingerspelled words become loan signs. Perhaps, rather than "omission," a better description of this phenomenon is "elision"; that is, the general shape of the word is retained, and the medial letters are barely hinted at, rather than articulated fully. This is consistent with articulatory processes for fingerspelling that have been described elsewhere (Akamatsu, 1985; Battison, 1978).

Another set of errors included substitution of a letter, for example, C-S-D-E for code, Y-N-F for inf(ection). This, again, is consistent with hand

formation characteristics, as described by Akamatsu (1982). In these cases, S and O are both closed handshapes, and Y and I both involve extension of the fourth finger. The difference between Y and I is in whether the thumb is also extended. In fluent fingerspelling, the thumb is often in a neutral position rather than fully crossed over the other fingers as it might be in letter-by-letter fingerspelling. It may in fact be the case that these are instances of careless articulation that result in entirely different letters being formed. Again, for comprehension of a word gestalt, missing letters might not be a factor. However, for learning specific letter sequences, the effect could be devastating.

A third type of error occurred when there was a mistiming of the letters, such that letters were transposed (T-R-A-D-I-Y for tardy, where the A and R were transposed; J-A-E for jea(n), where the E and A were transposed), or a letter that was supposed to be doubled is not (C-O-L-I-E for collie) and/or an adjacent letter was (e.g. V-A-L-E-E-Y for valley). These errors, like the two cases above, are not crucial for the reception of fingerspelling in a discourse, but may limit the receiver's ability to recognize a printed example of the target word.

One other interesting error occurred with one particular teacher. This teacher substituted an A for several vowels, for example, C-R-A-S-T for crust, A-N-T-I-C-L-A-N-E for anticline, E-R-A-S-I-S-N for erosion. It appears as though she used the A as an "all-purpose" vowel, much as the schwa is used as a neutral vowel. The net result of these error types is that the movement envelope of the whole word is preserved, even though the individual target letters are not there. The misspellings do not generally preserve pronunciation, suggesting that the teachers are not using a phonetic base to guide their spellings. This has been observed among deaf adults fingerspelling

extremely familiar words, or words that have been used several times in the same conversation. Because they were taught not to think letter by letter in fingerspelling, it is unlikely that they are visualizing the printed word and "reading" the letters from that.

Discussion

The English language is made up of words borrowed from many other languages that were not related to each other, and this has given rise to an orthography that is both morphologically and phonetically based. This means that one cannot rely purely on sound to spell a word, and pronunciation cannot reliably be predicted by spelling. When hearing people fingerspell, this knowledge must be coordinated with what they are speaking, as well as with what they are signing; that is, two sets of articulators (hands and mouth) and two feedback systems (auditory and kinesthetic) must be coordinated. We are well aware of how difficult it is to speak and sign simultaneously.

Although there exist 26 unique hand symbols to represent the 26 letters of the alphabet, fluent fingerspelling among deaf adults has been shown to preserve the shape of the word, rather than the individual letters. This is the kind of fingerspelling to which infants are exposed before they learn to "read" printed letters of the alphabet. The students in the classrooms in this study were all capable of recognizing letters of the alphabet, and were learning to read and write English. They were also communicating, to a large degree, in English.

The task their teachers faced was to provide models of English words through the manual/visual modality. The dilemma arises when manual articulatory patterns (i.e., what counts as a movement envelope, the sequential production of individual letters) must be coordinated with orthographic rules

and speech patterns; that is, when fingerspelling in a total communication setting, the teacher must say an entire word while simultaneously spelling out, letter by letter, the same word with the hands. It is obvious here how difficult it is to speak and fingerspell simultaneously.

Let us reexamine some of the questions raised in the beginning of the paper. First, when do teachers fingerspell? Our data suggest that they do not spell often, but when they do, it is because they are seeking a specific English target word, or because they choose not to use a sign for a specific concept. Perhaps no sign exists, or perhaps they do not know the sign.

Second, how much do teachers fingerspell? In our study, fingerspelling was used in a minuscule number of instances. It appears from the tapes that the teachers might be counting on the students to understand the words that are spelled in the context of the sentence and communicative interaction. While this may not be an unusual assumption--deaf parents fingerspell to their preliterate children all the time--the children in these schools do not all have the advantage of knowing enough English to be able to guess at the meaning of a target word.

Third, how well do teachers fingerspell? To some extent, the answer to the "how well" question depends on the communicative intent of the teacher: Is it just to use an English word or it is to teach a new word? One of the teachers (Teacher #3) was relatively clear in her fingerspelling and had few misspellings. Another teacher (Teacher #1) so rarely fingerspelled that it is difficult to judge how well she fingerspells. A third teacher (Teacher #4) was a comparatively frequent fingerspeller, but used mainly gestalt finger-spellings and rarely spelled a word letter by letter. In fact, she claimed to be a terrible speller and explained her inability to fingerspell letter by letter on this basis.

Finally, what are deaf children expected to do with fingerspellings used by their teachers? They are expected to learn English words and their spellings, recognize these words in print, and write these words. How they are to learn this, in the relative absence of clear fingerspelling models that relate to the printed word, is still an open question.

Hearing people learning to sign report how difficult it is to learn to read fingerspelling. If the expectation exists that fingerspelled words are made up of hand configurations that represent the letters in the word rather than the shape of the whole word, it is not surprising that they are looking for something that is not usually there. In contrast, a knowledge of the individual hand configurations is needed to predict, or fill in, what is missing from the word's movement envelope. This is true for hearing adults learning to sign, and for young deaf children learning to read fingerspelling and connect that knowledge to the printed word.

It appears, therefore, that teachers should be extra careful about how they fingerspell, particularly when introducing and teaching new words. We had in our sample a teacher who had a student who "couldn't read fingerspelling." To accommodate this student, the teacher kept her fingerspelling to a minimum. This is not helpful. Not only is the student deprived of practice with reading fingerspelling, she is not using a potential processing mechanism for learning new words: the visual/kinesthetic feedback loop. Once the teacher is assured that the students know the target word, a more fluent, natural (not sloppy) form of fingerspelling may be adopted.

Implications for Teaching in Simultaneous Communication Classrooms

The effective use of fingerspelling demands not only the ability to spell, but fluency in fingerspelling. Fluency refers to the ability to automatically generate individual handshapes and to the timing of these

handshapes in a smooth sequence, resulting in the creation of a movement envelope. As Hanson (1982) pointed out, the processing of individual letters depends to some extent on the surrounding letters, suggesting that coarticulation takes place in fingerspelling.

Children may not need to use fingerspelling to learn spelling, since the performance task is writing, but they can use fingerspelling to acquire new words in conversation. There may be certain justifiable "shortcuts" that develop as fluency develops (e.g. elisions and omissions of medial letters) that allow readers to process fingerspelling in gestalts within the context of the discourse to occur. However, these gestalts should be carefully distinguished from careless errors that interfere with communication. If teachers rely only on the movement envelope for the children's perception, without teaching the individual letters, then the children will not be able to recognize the printed words when they see them, even if they know how to use the fingerspelled word in conversation.

Some Hypotheses for Future Research

In this section, several hypotheses are listed for future investigations. These hypotheses are based on what we already know about fingerspelling, and what we have gleaned from this study.

1. **If one uses the movement for reading fingerspelling conversation, it is not necessary to know the individual letters.** The gestalt of the word, much like loan words, is enough to understand the target concept.

2. **It is not necessary to know the target word's individual letters if one uses movement envelope for production.** Again, the gestalt of the word will allow the receiver to retrieve the target concept.

3. **The use of the movement envelope alone for acquiring new words in English precludes learning the actual spelling of the words.** The only way to learn the letters that go in the envelopes is to employ a "cipher" (letter-by-letter) model of fingerspelling. Such a model would include reciting the letters, writing the word, fingerspelling the word, practice reading the printed word, and practice reading the fingerspelled version of the word.

If teachers do not use fingerspelling, and especially if they do not know equivalent signs, they may be limiting children's knowledge of a variety of English words (even if they do not know the signs) simply because they limit what they say to children to what they, the teachers, can sign.

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